

REMARKS

Claims 17-34, 37, and 39-56 are pending in the application. By this Amendment, claims 17-20, 31-34, and 56 are amended for clarification as addressed below, and claims 37 and 39-55 are canceled. Applicant requests reconsideration and allowance in view of the following remarks.

Means-Plus-Function Language and Rejections Under 35 U.S.C. § 112, Second Paragraph

As an initial matter, the Examiner assesses whether various elements recited in the claims are means-plus-function elements to be interpreted under 35 U.S.C. § 112, sixth paragraph. Having done so, the Examiner then rejects various claims as indefinite under 35 U.S.C. § 112, second paragraph, due to minor inconsistency between the form in which the function was specified (-ing gerund form versus -tion noun form of the function) or, more significantly, due to alleged insufficient disclosure in the specification to support the Examiner-adjudged means-plus-function elements in the claims. Applicant respectfully submits that the first part of the Examiner's analysis is inconsistent and incorrect with respect to certain claim elements, and that the second part of the Examiner's analysis overlooked supporting disclosure in the specification and was therefore incorrect for that reason, too.

To eliminate any potential ambiguity or confusion, Applicant has amended the claims to be as clear as possible as to which elements should be construed as means-plus-function elements under 35 U.S.C. § 112, sixth paragraph, and which elements should not be so construed. In particular, the means for reproducing (subsequent references to it having been changed from "reproduction means" to "reproducing means") is a means-plus-function element, as is the image-analyzing means (newly specified as installed on the CPU-based device).¹ The means for illuminating with ultraviolet radiation (which the Examiner incorrectly interpreted as not falling under §112/¶6), on the other hand, has been amended to refer to a source of ultraviolet radiation to take it out of the purview of §112/¶6. Similarly, the computer means

¹ Although the specification and pending claims refer to processing instead of analyzing, Applicant submits that the term analyzing is somewhat more descriptive of what the recited means do and is, in fact, supported by the application as filed.

(which the Examiner may or may not have construed correctly as not within the purview of §112/¶6) has been amended to refer to a CPU-based device (clearly not a means-plus-function element), and the means for controlling (which the Examiner correctly interpreted as falling under §112/¶6) has been amended to refer to a controller to take it out of the purview of §112/¶6 as well as to render moot the issue of support for that element which the Examiner raised.²

As for support for the means-plus-function elements, Applicant previously addressed that issue with respect to the means for reproducing. With respect to the image-analyzing means, on the other hand, support for that element may be found, for example, at application paragraph 31, which explains that

[t]he central unit 9 comprises software for image-processing and more specifically for measuring the width of the weld directly from the image. This is usually referred to as a real-time image-processing system. When the width of the weld is measured according to the proposed method, use is made of, for example, an edge-detection algorithm or some other type of image-processing algorithm which utilizes contrast differences for measuring the weld width.

Furthermore, with respect to the image-analyzing capabilities of such software, application paragraph 46 explains that

[a]part from the width of the weld, it is possible to obtain a great deal of information from the image of the welding area and to control the welding parameters and/or the spacing between the welding head 11 and the object 14 for welding on the basis of this information. Examples of such information are: the width of the melt, the geometry or shape (that is to say, ovality, surface smoothness and the like) of the melt, the characteristics of the arc (the width, projected size and the like of the arc), and the position and the shape of the flow eddies which can occur in the melt.

Thus, the claim-recited image-analyzing means is to be interpreted under 35 U.S.C. § 112, sixth paragraph, as covering such image-analyzing software and equivalents thereof, and Applicant submits that the claim element is properly supported. Accordingly, Applicant requests that the rejections under 35 U.S.C. § 112, second paragraph, be withdrawn.

² As noted at application paragraph 63, the CPU-based device (“computing means 9”) and the controller (“means 10 for controlling”) could be constituted by one and the same device.

Art-Based Rejections

Claims 17, 18, and 20-26³ are rejected under 35 U.S.C. § 103(a) based on Maram et al., U.S. 4,767,911, in view of Kovacevic et al., U.S. 5,481,085. According to the Office Action, Maram discloses all elements recited in those claims except for illuminating the welding area with ultraviolet radiation, for which feature the Examiner relies on Kovacevic. In particular, the Examiner asserts that Maram teaches computer means for processing a reproduction image as per independent apparatus claim 17 and reproducing the welding area as per independent method claim 20. Applicant respectfully traverses that rejection.

In Maram, a collimated beam of light is shone onto the surface of a weld pool and is reflected off of it, and the reflected beam of light strikes a photo-position detector 34. See, for example, Figure 1. The depth of penetration of the weld is then evaluated based on where the reflected beam of light strikes the photo-position detector 34. More specifically, when the weld penetrates all the way through to the opposite side of the workpieces that are being joined together, the weld pool will sag; the inclination of the weld pool's surface will change; and the location where the reflected beam of light strikes the photo-position detector 34 will change accordingly. See, for example, column 3, line 64 through column 4, line 23. Therefore, by monitoring where the reflected beam of light strikes the photo-position detector 34 and "watching" to see when that position changes by a predetermined threshold amount, complete penetration of the weld can be detected. See, for example, column 5, lines 3-32.

The claimed invention, in contrast, is more sophisticated than that. As specified in the claims with respect to both the apparatus aspects of the invention (e.g., independent claim 17) and the method aspects of the invention (e.g., independent claim 20), the welding area is reproduced, which yields a reproduction image of the welding area. In other words, simply put, a picture, which can be still or moving, is taken of the weld area. Maram does not disclose that.

³ The first line of Section 6 (page 5) of the Office Action refers to claims 17, 18, and 21-26. The body of that section of the Office Action, however, addresses claims 17-26, 31-34, 37, 39-46, and 51 (and not all in sequential numerical order). Therefore, it is completely unclear as to whether all of those claims were intended to be rejected based on Maram in view of Kovacevic or just claims 17, 18, and 21-26.

Rather, as explained above, all Maram discloses is that the location where the reflected beam of light strikes the photo-position detector 34 is monitored. Although Maram does, in fact, indicate that that photo-position detector 34 may be a CCD array (column 3, lines 45-46), there is no disclosure at all that a reproduction image of the welding area is generated or produced. To the contrary, Maram actually specifies (column 3, lines 52-56) that “[t]he photo-position detector 34 is connected to either a digital or analog high speed data acquisition system 36 which distinguishes the modulated laser light from any high intensity light from the arc which manages to pass through the optical band pass filter 32.” Thus, Maram is focused on the location where the reflected beam of light strikes the photo-position detector 34 and nothing else.

Moreover, the apparatus claims now recite more clearly image-analyzing means for analyzing the reproduction image. As addressed above, that element is to be considered under 35 U.S.C. § 112, sixth paragraph, and there is clearly nothing in Maram that approaches the application-disclosed structure (software) either identically or by equivalents.

Further still, Kovacevic does not remedy these deficiencies of Maram as a reference. Applicant distinguished Kovacevic previously, and the Examiner is expressly not relying on Kovacevic for disclosure of reproducing the welding area or analyzing a reproduction image of the welding area. Rather, the Examiner is relying on Kovacevic only for its disclosure of ultraviolet illumination, and that does not “fill the gaps” in the Maram reference. Thus, the combination of references does not establish a *prima facie* case of obviousness because it does not yield the claimed invention. Accordingly, Applicant traverses the rejection and requests that it be withdrawn.

Claims 27-30 are rejected under 35 U.S.C. § 103(a) based on Maram in view of Kovacevic and further in view of Justice et al., U.S. 4,225,771, on which the Examiner relies for disclosure of a band-pass filter being used which corresponds to the predetermined wavelength of the illuminating light source. These claims depend from independent claim 20. Accordingly, Applicant traverses the rejection for at least the reasons set forth above and requests that it be withdrawn.

Claims 47-50 and 53 are rejected under 35 U.S.C. § 103(a) based on Maram in view of Kovacevic and further in view of Justice et al., U.S. 4,225,771, on which the Examiner relies for disclosure of a band-pass filter being used which corresponds to the predetermined wavelength of the illuminating light source. Those claims have all been canceled. Accordingly, the rejection is moot and Applicant requests that it be withdrawn.

Claims 52 and 54 are rejected under 35 U.S.C. § 103(a) based on Maram in view of Kovacevic and further in view of Tamada et al., U.S. 5,481,085, on which the Examiner relies for disclosure of a camera with a diaphragm for controlling exposure of the object being imaged and hence quality of the image produced thereby. Those claims have been canceled. Accordingly, the rejection is moot and Applicant requests that it be withdrawn.

Claims 55 and 56 are rejected under 35 U.S.C. § 103(a) based on Maram in view of Kovacevic and further in view of Justice, on which the Examiner relies for disclosure of a band-pass filter being used which corresponds to the predetermined wavelength of the illuminating light source. To the extent claim 55 is canceled, the rejection is moot. Independent claim 56, on the other hand, specifies reproducing the welding area with a means for reproducing, and, as addressed above, the base combination of references fails to disclose that concept. Accordingly, Applicant traverses the rejection for at least the reasons set forth above and requests that it be withdrawn.

In view of the foregoing, Applicant submits that all claims are in condition for allowance, and timely Notice to that effect is respectfully requested.

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The undersigned representative requests any extension of time that may be deemed necessary to further the prosecution of this application.

The undersigned representative authorizes the Commissioner to charge any additional fees under 37 C.F.R. 1.16 or 1.17 that may be required, or credit any overpayment, to Deposit Account No. 14-1437, Order No. 7589.204.PCUS00.

In order to facilitate the resolution of any issues or questions presented by this paper, the Examiner should directly contact the undersigned by phone to further the discussion.

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Respectfully submitted,

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